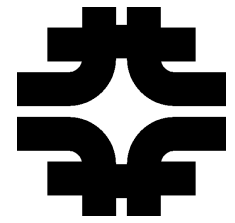


Neutrino Detector Operations

Greg Bock for
Gina Rameika
Fermilab
March 29, 2005



Introduction

Two Running Experiments

MiniBooNE: Operating since September 2002

Approaching $5E20$ Integrated Protons on Target

Goals : Investigate the LSND indication of neutrino oscillation

Will continue during FY06

MINOS: Operating since March 2005

1-2 $E17$ Integrated Protons on Target to date

Goals : Precision Measurement of Δm^2 , $\sin^2 2\theta$ in the region indicated by the atmospheric neutrino deficit measured by SuperK

1 - $3E20$ POT per year and climbing per the Proton Plan

Approved to Operate FY05-FY09

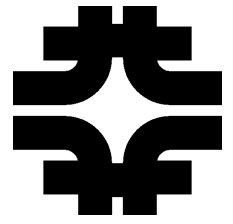
Future Experiments (not discussed in this review)

Minerva (Stage I approval)

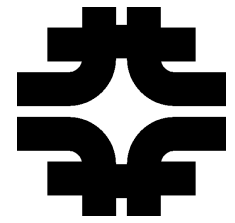
Nova (proposal phase)

FINeSSE (LOI)

MiniBooNE Organization and Budget

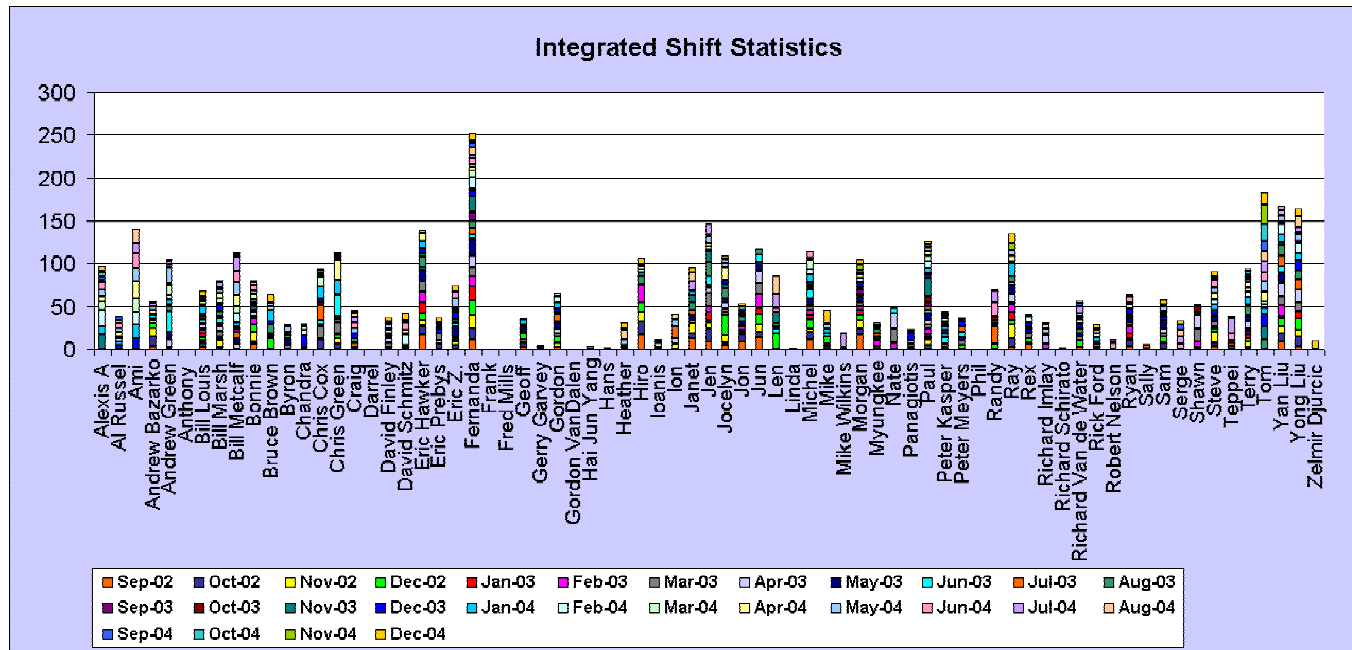


- MOU with lab defining big picture responsibilities
- Agreement between collaborating institutions defining operational roles and responsibilities
 - 15 institutions; 77 collaborators
- Current renegotiating MOU with CD for computer support
- Annual M&S operating budget less than \$100K and about 4 FTE's
 - Computing, Liquid Nitrogen, HVAC repair

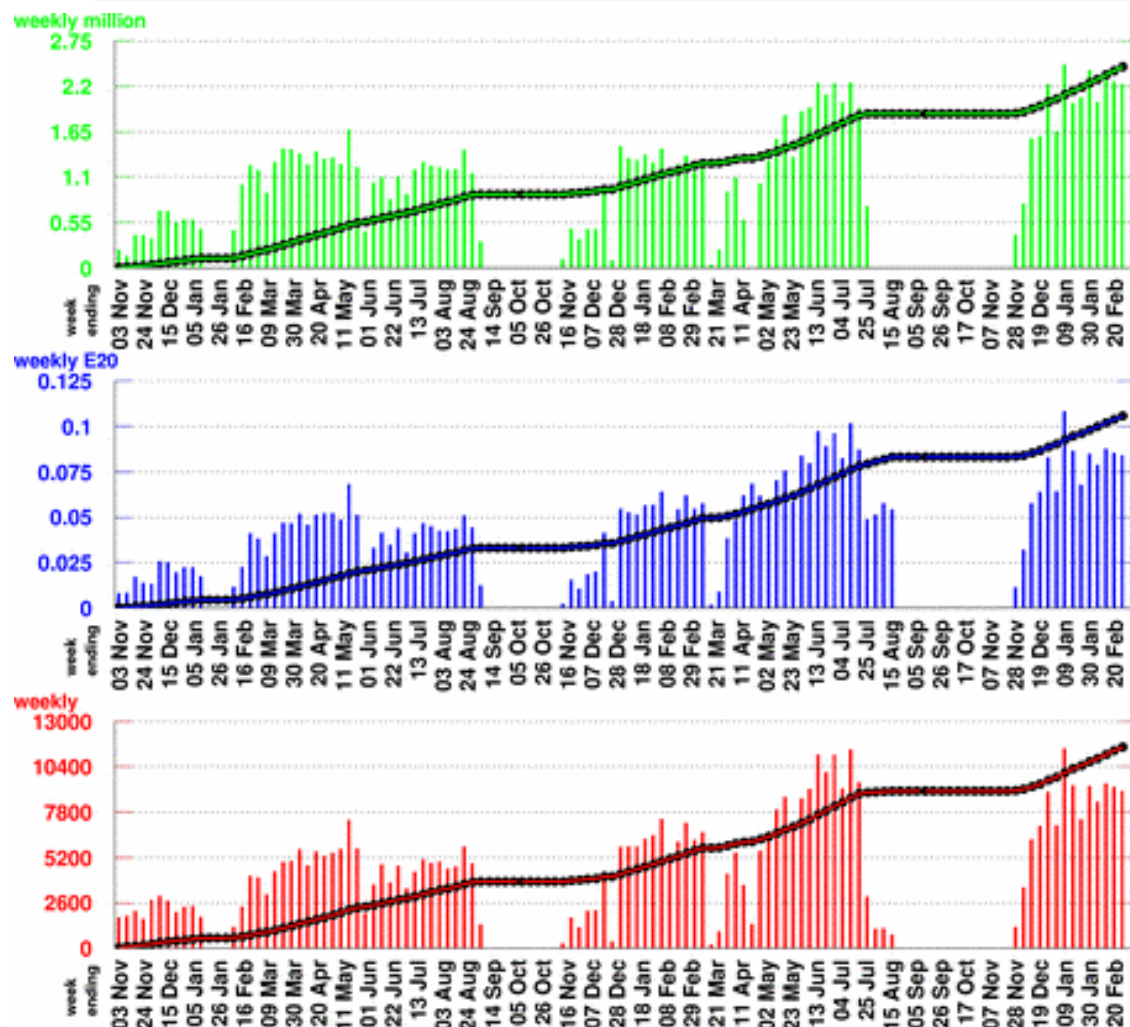
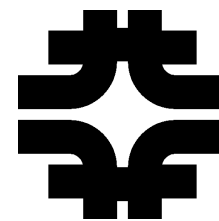


MiniBooNE Shifts

- Run 3x8 hour shifts in normal operations (1x24 hour shifts during accelerator shutdowns)
- Collaborators are individually responsible for shifts



MiniBooNE Beam Delivery



Number of Horn Pulses

To date: 110.71 million
Largest week: 2.46 million
Latest week: 2.22 million

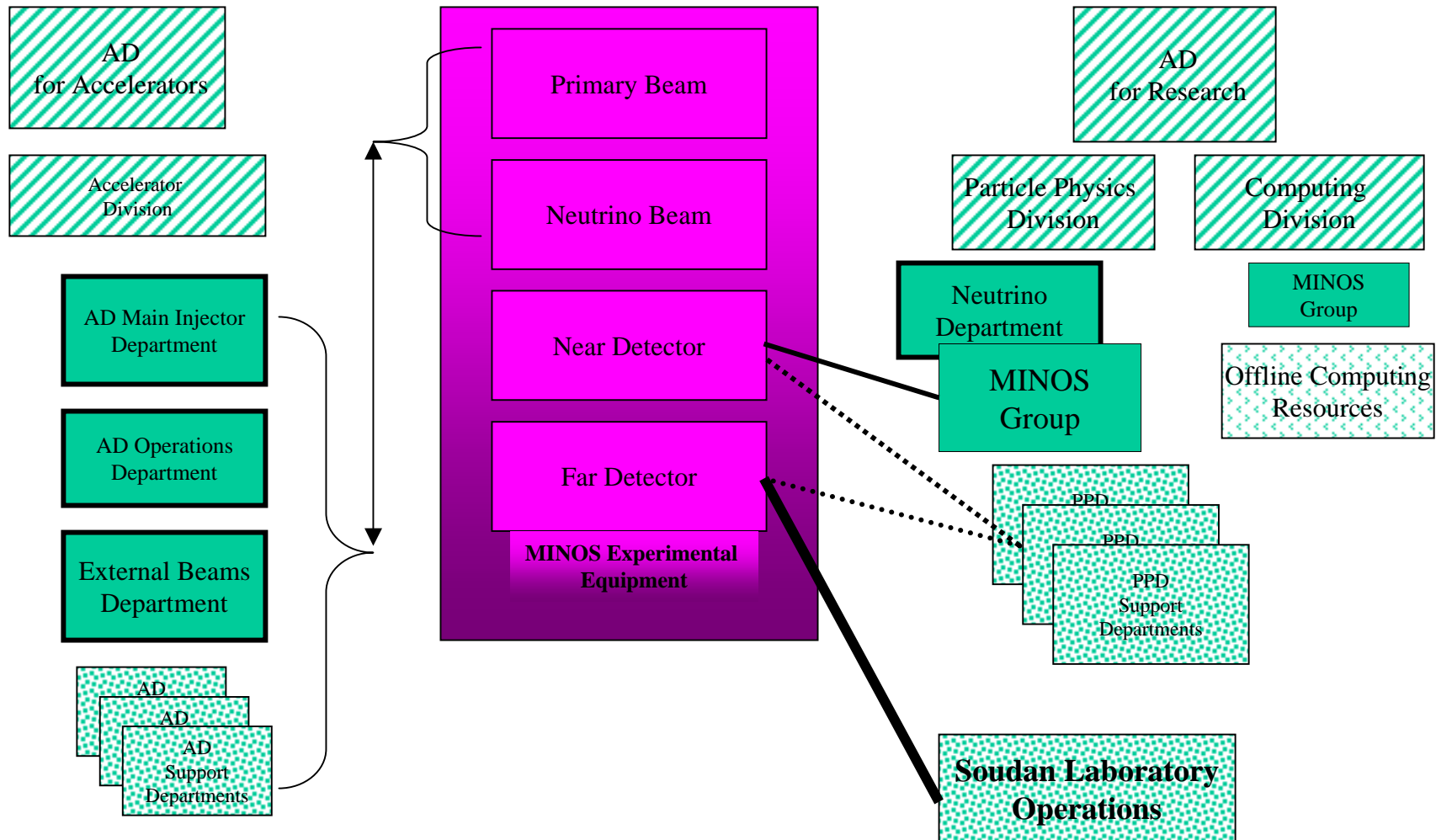
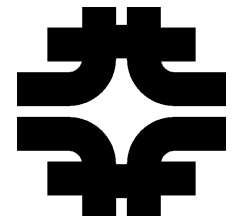
Number of Protons on Target

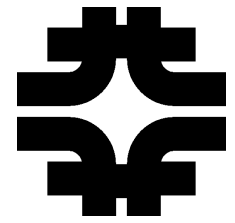
To date: 4.6561 E20
Largest week: 0.1084 E20
Latest week: 0.0842 E20

Number of Neutrino Events

To date: 488196
Largest week: 11447
Latest week: 9015

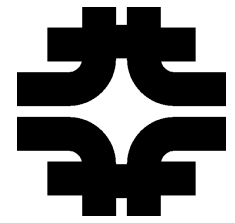
MINOS Organization post Construction Project





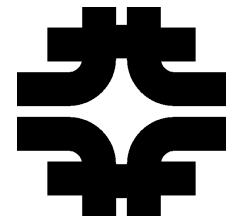
MINOS Operations

- **Fermilab**
 - Operations
 - Wilson Hall 12th floor control room (no control room at Exp Hall)
 - Monitors and controls Far and Near Detector
 - » 24/7 Shifts during beam operations began 3/7/05
 - Remote monitoring and control as needed (i.e. DAQ support from UK)
 - Funding and Staffing
 - Begin ramp up of operations M&S in FY04
 - All project equipment codes closed end of Q1 of FY05
 - FY05 M&S funds allocated for transition to operations
 - Future needs to be defined based on FY05 experience
 - MOU in draft form; ready for circulation April 15
 - About \$500-600K M&S /year and a dozen FTEs

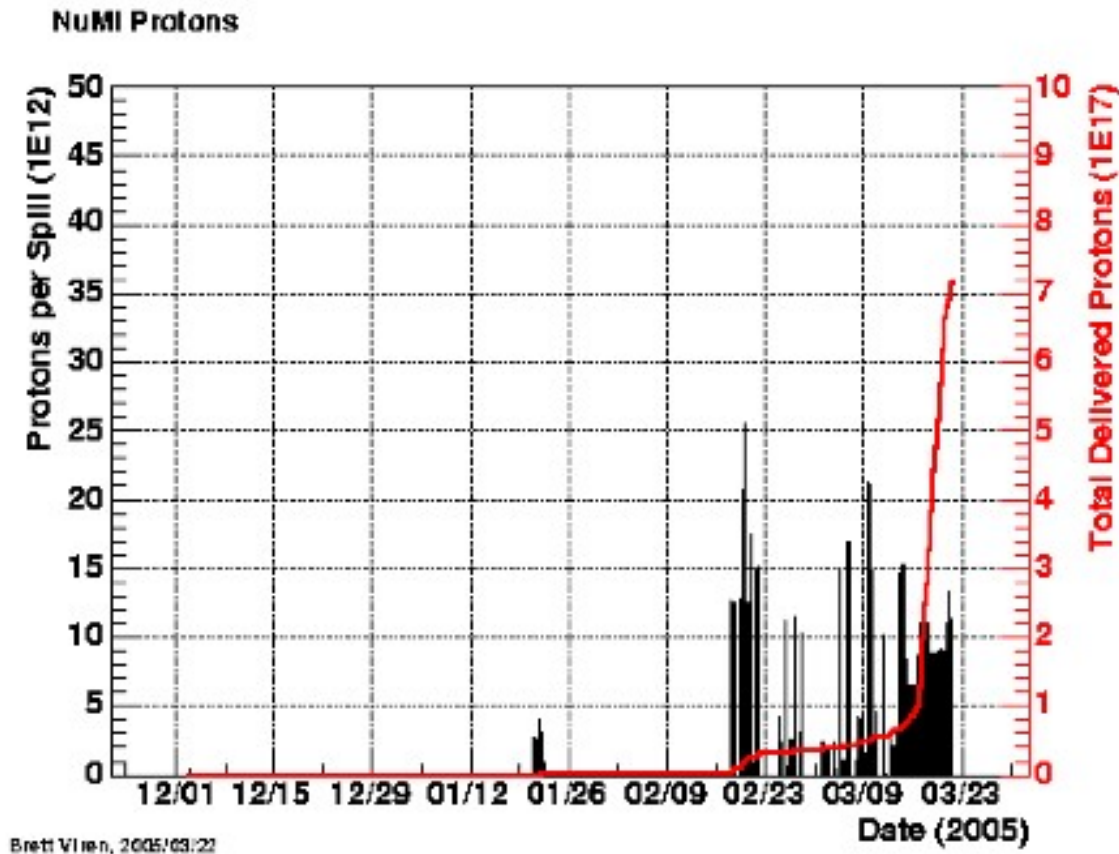


MINOS Operations

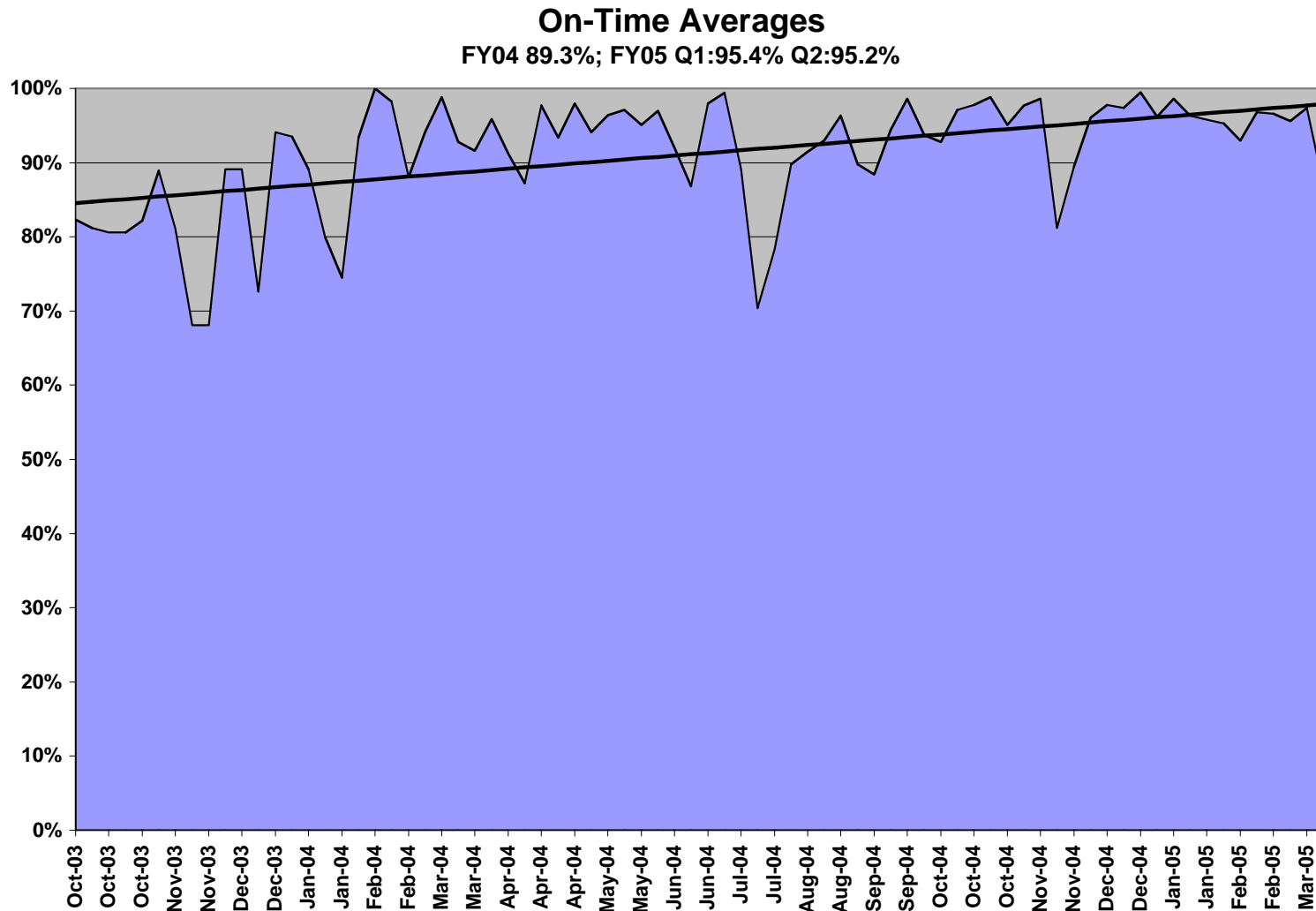
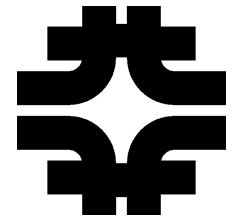
- **Soudan Laboratory**
 - Operations
 - Minecrew + visiting physicists underground Monday-Friday 7:30 am - 5:30 pm
 - Surface Building for evenings and weekends
 - Shift leaders house for evenings and weekends
 - 24/7 on-call for access (driven by CDMS need)
 - Funding
 - Begin ramp up in FY01
 - All support from PPD operating budget; began in FY04 \$1.3M/yr budget
 - Very limited funds to support infrastructure improvements
 - MOU between Fermilab and University of Minnesota defines roles and responsibilities

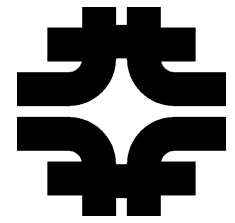


Protons Delivered to NuMI Target



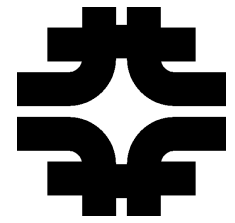
MINOS Far Detector Live Time





MINOS Computing

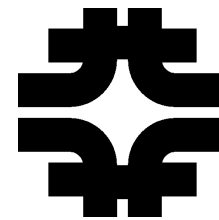
- MOU between experiment and CD
 - Defines offline resource needs
- MOU between experiment and FNAL
 - CD section defines PREP equipment and maintenance and repair agreements
- Use CD hardware resources for offline (batch processing) analysis but method and manpower defined and provided by MINOS collaboration
 - Began batch processing Far Detector data for cosmic/atmospheric physics analysis in 2003



Risks and Mitigations

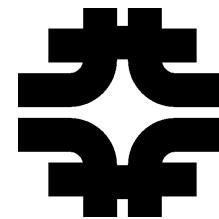
- Risks and Mitigations
 - MINOS Soudan Laboratory Operations
 - Funding and staffing is planned
 - MINOS Hall Water Handling
 - Added redundancy in hardware
 - Training maintenance and support teams
 - Transition to Operating Mode well underway
 - MiniBooNE Collaborator Support for travel, etc is a concern
 - (Accelerator Division executing the Proton Plan to assure that these experiments achieve the goals)

Neutrino Experiments Total Budget FY04-09



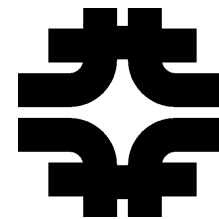
	<u>FY04</u> <u>ACTUAL</u> <u>BASE</u>	<u>FY05</u> <u>BUDGET</u>	<u>FY06</u> <u>PBR</u>	<u>FY07</u> <u>FLAT TO</u> <u>PBR</u>	<u>FY08</u> <u>FLAT</u>	<u>FY09</u> <u>FLAT</u>
Neutrino Experiments	4,670.2	3,566.8	3,471.6	3,469.9	3,528.1	3,598.7
NuMI / MINOS	4,335.6	3,240.6	3,020.0	3,078.5	3,136.5	3,204.4
MINOS	3,206.7	1,740.6	1,720.0	1,778.5	1,797.5	1,825.2
MINOS Experiment	1,770.4	930.7	898.4	934.8	934.8	940.9
Related Scientific Effort	940.0	355.0	355.0	365.0	376.0	387.2
Offline Computing	496.4	454.9	466.6	478.7	486.8	497.1
Soudan Operations	1,128.9	1,500.0	1,300.0	1,300.0	1,339.0	1,379.2
MiniBooNE	334.6	326.3	451.6	391.4	391.6	394.3
MiniBooNE Experiment	317.1	309.8	434.5	373.6	373.6	376.0
Offline Computing	17.5	16.5	17.1	17.8	18.0	18.3

Neutrino Experiments M&S FY04-09



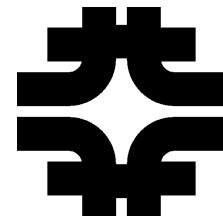
	<u>FY04</u>			<u>FY07</u>		
	<u>ACTUAL</u>	<u>FY05</u>	<u>FY06</u>	<u>FLAT TO</u>	<u>FY08</u>	<u>FY09</u>
	<u>BASE</u>	<u>BUDGET</u>	<u>PBR</u>	<u>PBR</u>	<u>FLAT</u>	<u>FLAT</u>
<u>Neutrino Experiments</u>	2,628.2	2,091.3	1,893.5	1,827.8	1,882.7	1,939.2
NuMI / MINOS	2,557.5	2,017.8	1,817.8	1,827.8	1,882.7	1,939.2
MINOS	1,428.6	517.8	517.8	527.8	543.7	560.0
MINOS Experiment	957.4	0.0	0.0	0.0	0.0	0.0
Related Scientific Eff	285.5	355.0	355.0	365.0	376.0	387.2
Offline Computing	185.6	162.8	162.8	162.8	167.7	172.8
Soudan Operations	1,128.9	1,500.0	1,300.0	1,300.0	1,339.0	1,379.2
MiniBooNE	70.7	73.5	75.7	0.0	0.0	0.0
MiniBooNE Experiment	70.7	73.5	75.7	0.0	0.0	0.0
Offline Computing	0.0	0.0	0.0	0.0	0.0	0.0

Neutrino Experiments FTE FY04-09

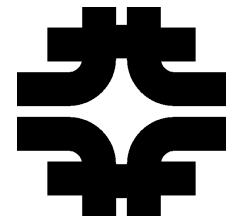


	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	<u>FY07</u>	<u>FY08</u>	<u>FY09</u>
Neutrino Experiments	22.4	15.5	15.9	15.9	15.3	14.8
NuMI / MINOS	19.5	12.9	12.1	12.1	11.7	11.3
MINOS	19.5	12.9	12.1	12.1	11.7	11.3
MINOS Experiment	8.9	9.8	9.1	9.1	8.7	8.4
Related Scientific Effort (Base \$)	7.2	0.0	0.0	0.0	0.0	0.0
Offline Computing	3.4	3.1	3.1	3.1	3.0	2.9
MiniBooNE	2.9	2.7	3.8	3.8	3.6	3.5
MiniBooNE Experiment	2.7	2.5	3.6	3.6	3.5	3.4
Offline Computing	0.2	0.2	0.2	0.2	0.2	0.2

Organizing for the Present and Future Neutrino Program



- Ongoing organizational restructuring to further strengthen the Fermilab neutrino program
 - Forming a Neutrino Department in PPD
 - MiniBooNE
 - MINOS
 - MINERvA
 - NOvA
 - Facilitate development of a coordinated program
 - Provide support for experiment analysis, operations, future planning and construction
 - Consolidate and streamline budgets



Summary

- MINOS and MiniBooNE are simple, robust experiments
 - Detectors are reliable and operate with minimum intervention
 - M&S costs in support of operation are modest
 - Well understood for MiniBooNE
 - Gaining experience with MINOS; no major problems anticipated
 - Experiment operations are managed and supported by the collaborating institutions
- New Neutrino Department will consolidate operations and future planning